Geophysical Research Abstracts
Vol. 15, EGU2013-10910, 2013
EGU General Assembly 2013

Evaluating the potential of X-band polarimetric radar observations in mountainous hydrology

Marios Anagnostou (1), John Kalogiros (1), Efthymios Nikolopoulos (2), Emmanouil Anagnostou (3), Francesco Marra (2), Elisabeth Mair (4), Giacomo Bertolidi (4), Ulrike Tappeiner (5), and Marco Borga (2)

(1) IERSD, National Observatory of Athens, Athens, Greece (ma111@engr.uconn.edu, jkalog@noa.gr), (2) Department of Land and Agroforest Environment, University of Padova, Padova, Italy (enikolop@engr.uconn.edu, marco.borga@unipd.it)), (3) Civil and Environmental Engineering, University of Connecticut, Storrs, Connecticut, USA (manos@engr.uconn.edu), (4) Institute for the Alpine Environment, EURAC Research, Bolzano, Italy (elisabeth.mair2@eurac.edu, giacomo.bertoldi@eurac.edu), (5) Institute of Ecology, University of Innsbruck, Innsbruck, Austria

Alpine catchments hydrology is strongly determined by orographic effects on the space-time structure of precipitation. Mountain precipitation results from a multitude of processes such as mechanical lifting, enhancement, shadowing etc. Many of these processes are poorly understood, especially at small spatial and temporal scales. Consequently, this limits the predictive capability of hydrological models and our understanding of the majority of the precipitation-related natural hazards occurring in both high- and lowlands. This lack of knowledge is mainly due to the intrinsic limitations of our best measurement techniques: raingauges and weather radars. Raingauges provide relatively accurate but only point-like observations, while weather radars produce instantaneous spatially distributed rainfall maps but their operation over complex terrain creates a number of limitations, which make their estimates reliable in a limited space-time domain. A solution to this limitation might be the use of a number of cost-effective short-range X-band radars as complement to raingauges and conventional, large and expensive weather radars.

The study focuses on a 64 km2 mountainous basin located in Northern Italy. Rainfall observations from a dense network of raingauges located at different elevation, a C-band and an X-band polarimetric mobile unit are used to force a semi-distributed hydrologic model. A number of storm events are simulated and compared to investigate the potential of using high-res rainfall input from X-band polarimetric radar for simulating the hydrologic response. Events have been discriminated on the basis of rainfall intensity, snowfall limit and hydrological response. Results reveal that in contrast with the other two rainfall sources, X-band observations offer an improved representation of orographic enhancement of precipitation, which turns to have a significant impact in simulating peak flows.